

## New species from the *Leucopogon pulchellus* group (Ericaceae: Styphelioideae: Styphelieae)

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### Abstract

Hislop, M. New species from the *Leucopogon pulchellus* group (Ericaceae: Styphelioideae: Styphelieae). *Nuytsia* 24: 71–93 (2014). Five new species and one new subspecies of *Leucopogon* R.Br. (*L. audax* Hislop, *L. corymbiformis* Hislop, *L. darlingensis* Hislop, *L. decrescens* Hislop, *L. subsejunctus* Hislop and *L. darlingensis* subsp. *rectus* Hislop) are described, illustrated and mapped. Aspects of the morphology and taxonomy of the informal *Leucopogon pulchellus* Sond. group are discussed and an interim key is provided to distinguish between the five informal groups and other unplaced species of *Leucopogon* s. str. from Western Australia.

### Introduction

The *Leucopogon pulchellus* Sond. group (or Group C) is one of five informal, subgeneric groups delineated by Hislop and Chapman (2007) to accommodate the majority of the Western Australian species of *Leucopogon* R.Br. s. str. This interim classification was raised in large part to provide a taxonomic framework into which the many Western Australian taxa then in need of formal descriptions could be placed. It was considered a better alternative than attempting to utilise Bentham's (1868) manifestly artificial classification. The informal groups are based on morphological characters only, particularly, aspects of their fruiting morphology. Although, as discussed previously (Hislop & Chapman 2007), the *L. australis* R.Br. group (or Group A) comprises several elements and is best regarded as one of convenience only, the morphological basis for the integrity of the others is much stronger. Before any new infrageneric classification can be formalised however, a comprehensive molecular phylogeny will be needed to test the monophyly of these groups. This should include a broad sample of the eastern species as well as the several anomalous elements within the western taxa not placed in the current informal classification.

Earlier papers have provided morphological synopses and keys, published lectotypes where desirable, and described new taxa for Groups A (Hislop & Chapman 2007; Hislop 2008, 2009a), B (Hislop 2012) and E (Hislop 2009b). The current paper begins the same process for the large *L. pulchellus* group (Group C).

### Notes on the morphology and taxonomy of the *Leucopogon pulchellus* group (Group C)

Group C is in large part defined by fruiting characters. The drupe is usually cylindrical or narrowly

ellipsoid in shape, occasionally narrowly ovoid or narrowly obovoid and often with longitudinal striations. It is circular to strongly angular or lobed in section. The apex is usually more or less truncate with angular shoulders, but occasionally the shoulders are rounded or distinctly lobed. The mesocarp is insignificant, being more or less dry when fresh and with no raised reticulum when dried. A gynophore is present between the receptacle and the fruiting locules.

In the dried condition the gynophore appears as an area of soft, shiny, translucent tissue, typically arranged in longitudinal or oblique ridges and grooves (Figure 1) around a narrow axis. It varies in length and width from rather inconspicuous and stipe-like to well-developed and wider than the body of the drupe. It seems likely that this structure has a role in fruit dispersal, possibly functioning as an elaiosome. A gynophore of this kind is also found in members of the *L. carinatus* R.Br. group as well as in some of the *Leucopogon* segregate taxa (i.e. those species currently assigned to the genus but which occur outside of the *Leucopogon s. str.* clade, *sensu* Quinn *et al.* 2003).

Aside from fruiting characters there is also an inflorescence difference that assists in distinguishing the members of Group C from those of Group A. Whereas the species of Group A have their upper leaves and lower fertile bracts clearly dimorphic, in Group C there is a gradual upward transition, at least on the main axes, from the lowest bracts, which are indistinguishable from the upper leaves, to the upper bracts which are significantly different in shape and texture (i.e. more 'bract-like'). There is a subgroup within Group C (i.e. *L. obtusatus* Sond. and allied species) that is characterised by relatively few-flowered inflorescences and very small leaves. In these species there is little difference between the leaves and any of the fertile bracts. A partial floral difference between Groups A and C is the absence/presence of an indumentum on the ovary. Whereas ovarian hairs are always lacking in Group A, they are associated with many species in Group C, including the five described below. Although the occurrence of such hairs is significant in the taxonomy of the group, it now appears to be the case that it is rarely, or maybe never, an absolutely consistent character. While most species have a strong tendency towards having either glabrous or hairy ovaries, it can be expected that plants which are atypical in this respect are likely to occur, at least within some populations. Furthermore there are one or two widespread and variable species, such as *L. polymorphus* Sond. and *L. sprengelioides* Sond., in which glabrous or hairy ovaries are more or less equally common. For this reason, within the group the character is only useful in correlation with others.

Including the five new species published in this paper, Group C comprises 21 named species (Table 1) with a further eight recognised by phrase names on the census of Western Australian plants. Prior to this paper the most recent names to be published in the group, *L. psammophilus* E.Pritz., *L. cinereus* E.Pritz. and *L. minutifolius* W.Fitz. (the latter now considered a taxonomic synonym of *L. obtusatus*), appeared in the first decade of the twentieth century. The lack of alpha-taxonomic research since then has undoubtedly contributed to what might be described as a process of 'circumscription creep'. This phenomenon is characterised by an expansion of accepted species concepts to include one or more morphologically disparate elements. It is commonly encountered where larger genera have not been subject to recent taxonomic revision. Thus most of the new taxa that are now recognised in Group C had, through common usage, previously been regarded as variants of earlier-named species.

Group C contains areas of significant taxonomic complexity in which the identification of reliable morphological characters can be particularly challenging. Even after the recognition of the species described below, and excluding the remaining phrase-named taxa in the group which are relatively well-defined, a number of the earlier-named species are still very broadly circumscribed and include potential segregates. The taxonomic problems arise, in large part, from a general paucity of informative floral or inflorescence characters. To a degree this also applies within the previously treated groups,

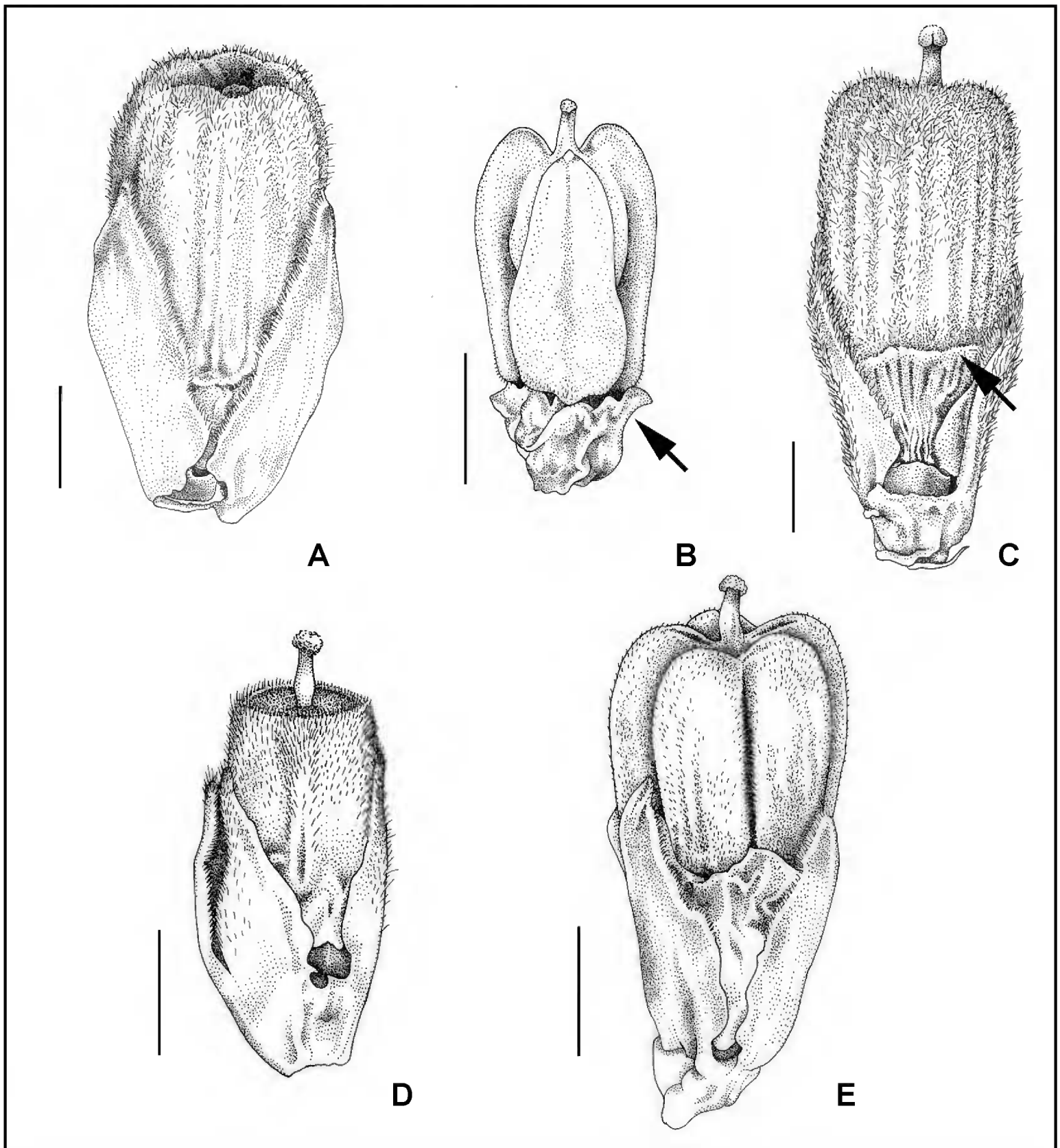


Figure 1. *Leucopogon* fruit. A—*Leucopogon audax*; B—*L. corymbiformis* (arrow indicates gynophore); C—*L. darlingensis* subsp. *darlingensis* (arrow indicates gynophore); D—*L. decrescens*; E—*L. subsejunctus*. Scale bars = 1 mm. Drawn by Ellen Hickman from T. Erickson TEE 204 (A), G.J. Keighery & N. Gibson 5076 (B), F. Hort 2086 (C), M. Hislop 3969 (D), M. Hislop 3962 (E).

but in Group C (and to a greater extent in Group D) it is more likely to be combined with a drupe morphology which is similarly lacking in taxonomically useful variation. This potentially leads to a taxonomy in which segregation between taxa is reliant in large part on foliar characters and where correlating differences in floral or fruiting characters may be only partial. While not necessarily a cause for concern where such foliar differences are relatively strong and consistent, as for example between *L. pulchellus* and *L. polymorphus*, where the foliar differences are more subtle or show signs of breaking down, there is an obvious need to proceed with considerable circumspection in seeking to delineate 'good' taxa. A molecular study into relationships within the group would be of considerable value in providing an independent means of interpreting the sometimes problematic morphological signal.

**Table 1.** Described species belonging to the *Leucopogon pulchellus* group (Group C).

<i>Leucopogon assimilis</i> R.Br.	<i>Leucopogon oldfieldii</i> Benth.
<i>Leucopogon audax</i> Hislop	<i>Leucopogon ozothamnoides</i> Benth.
<i>Leucopogon cinereus</i> E.Pritz.	<i>Leucopogon polymorphus</i> Sond.
<i>Leucopogon cordatus</i> Sond.	<i>Leucopogon polystachyus</i> R.Br.
<i>Leucopogon corymbiformis</i> Hislop	<i>Leucopogon psammophilus</i> E.Pritz.
<i>Leucopogon cucullatus</i> R.Br.	<i>Leucopogon pulchellus</i> Sond.
<i>Leucopogon darlingensis</i> Hislop	<i>Leucopogon rubricaulis</i> R.Br.
<i>Leucopogon decrescens</i> Hislop	<i>Leucopogon sprengelioides</i> Sond.
<i>Leucopogon fimbriatus</i> Stschegl.	<i>Leucopogon stokesii</i> Hislop
<i>Leucopogon gracillimus</i> DC.	<i>Leucopogon subsejunctus</i> Hislop
<i>Leucopogon obtusatus</i> Sond.	

**Methods**

This study was based on an examination of dried specimens housed at PERTH together with extensive field observations of the species described and their putative relatives. Relevant type specimens from the group were obtained on loan from BM, K and MEL. The distribution map is based on PERTH specimen data. Foliar measurements were taken from dried specimens. Leaf thickness was measured at the midrib half way along the lamina. When assessing leaf morphology care should be taken to confine observations to mature leaves. Inflorescence length was measured from the lowest fertile axil to the bud rudiment in terminal inflorescences or from the point of attachment at the axil to the bud rudiment in the case of axillary inflorescences. Floral measurements were taken from rehydrated flowers in natural posture, with the exception of the corolla lobes which were uncurled to their fullest length before measuring. The length of the anther sterile tip was measured in late bud or early flower, at or just before dehiscence. Only the free portions of the filaments were measured. Corolla lobe hair was measured at a point 0.5 mm below the lobe apex. The given fruit length is inclusive of the gynophore. At least five flowers per specimen were examined.

**Interim key to the informal groups (*sensu* Hislop & Chapman 2007) and other anomalous or otherwise unplaced species of *Leucopogon s. str.* from Western Australia**

- 1. Corolla lobes 0.6–0.8 mm long, internal surfaces of lobes obscurely papillate; anthers lacking a sterile tip ..... **L. extremus**
- 1: Corolla lobes at least 1.0 mm long, internal surfaces of lobes bearded, usually densely so; anthers usually with a sterile tip
  - 2. Anthers straight, lacking a sterile tip
    - 3. Unit inflorescences pendulous, well-separated from each other; style well-exserted from corolla tube; sepals narrowly ovate, acute, ± glabrous ..... **L. unilateralis**
    - 3: Unit inflorescences erect, densely aggregated into a capitate conflorescence; style not exserted from corolla tube; sepals very narrowly ovate, long-acuminate, the upper half terete and densely hairy on all surfaces ..... **L. plumuliflorus**
  - 2: Anthers always with a ± pale sterile tip, although the tip is sometimes short and rather inconspicuous, usually ± recurved in the upper half
    - 4. Nectary partite, comprising 5 separate scales
      - 5. Ovary 3–5-locular; corolla lobes usually ± hairy on external surfaces;

- drupe variously shaped, but never as below, an obvious mesocarp usually present, gynophore absent..... **Group B<sup>1</sup>**
- 5:** Ovary 2- or 3-locular; corolla lobes glabrous on external surfaces (except in *L. compactus* where they may be hairy); drupe narrowly ellipsoid, narrowly obovoid or cylindrical, without a significant mesocarp, gynophore present
- 6:** Ovary 2-locular, glabrous (except hairy in a variant of *L. glabellus*); drupe apex with smoothly rounded shoulders..... **Group D**
- 6:** Ovary 2- or 3-locular, hairy, usually with steeply antrorse or antrorse-appressed hairs; drupe apex truncate, usually with a narrow rim..... **'Northern Group'<sup>4</sup>**
- 4:** Nectary entire, truncate to distinctly lobed (but refer to note under 'Northern Group' below)
- 7:** Inner surface of corolla tube with 5 longitudinal inter-staminal bands of hair extending from the base of the corolla lobes (except in *L. paradoxus* where the hairs are reflexed into the tube from a narrow apical ring); drupe elliptic in section with 2 medial longitudinal grooves, apex a fleshy appendage  $\pm$  enveloping the style and stigma (except *L. paradoxus* which lacks an appendage and has a deciduous style), endocarp crustaceous ..... **Group E<sup>2</sup>**
- 7:** Inner surface of corolla tube glabrous, although hairs frequently reflexed into the tube from the corolla lobe bases; drupe rarely elliptic in section, without median longitudinal grooves, apex never with a fleshy appendage, endocarp woody (except in *L. gilbertii*)
- 8:** Unit inflorescences short, densely aggregated into a capitate conflorescence; most leaves on upper axes antrorse-appressed and stem-clasping; drupe  $\pm$  dry, obovate in outline, elliptic in section, endocarp crustaceous ..... ***L. gilbertii***
- 8:** Character combination not as above
- 9:** Flowers densely arranged along very short inflorescence axes, the axes shorter than subtending leaves; leaves strongly concave adaxially, those subtending the inflorescences markedly petiolate with the lamina sharply inflexed above the petiole; filaments inserted in the corolla tube well below the sinuses..... ***L. oliganthus* and allied taxa<sup>5</sup>**
- 9:** Character combination not as above
- 10:** Leaves strongly concave adaxially, densely hairy on the adaxial surface; at least the lower flowers within the inflorescence pedicellate below the bracteoles; ovary appressed-hairy in lower half; drupe without a significant mesocarp, with smoothly rounded shoulders ..... ***L. navicularis***
- 10:** Character combination not as above
- 11:** Drupes depressed-obovoid, depressed-globose, globose or ellipsoid with an obvious mesocarp present, apex usually rounded, but if  $\pm$  flat the shoulders always smoothly rounded, gynophore absent; upper leaves and

lower fertile bracts usually clearly dimorphic;  
ovary always glabrous ..... **Group A<sup>3</sup>**

**11:** Drupe cylindrical, narrowly ellipsoid, narrowly ovoid  
or narrowly obovoid, without an obvious mesocarp,  
apex truncate, usually with  $\pm$  angular shoulders, occasionally  
the shoulders rounded or distinctly lobed, gynophore present;  
upper leaves and lower fertile bracts rarely dimorphic on the  
main axes, typically grading from one to the other over  
several nodes; ovary variously hairy or glabrous ..... **Group C**

<sup>1</sup>For a key to the species of Group B, refer to Hislop (2012).

<sup>2</sup>For a key to the species of Group E, refer to Hislop (2009b).

<sup>3</sup>For a key to the species of Group A, refer to Hislop (2009a).

<sup>4</sup>The 'Northern Group' is a small group of mostly undescribed taxa centred on the Geraldton Sandplains bioregion. While most of these taxa have a partite nectary, it is entire in the case of *L. nitidus* Hislop and *L. sp.* Cataby (F. Hort 1638). The morphology of the 'Northern Group' is discussed in Hislop (2011: 82).

<sup>5</sup>*Leucopogon oliganthus* E.Pritz. together with *L. cochlearifolius* Strid, *L. amplexans* Ostenf. and one or maybe two other undescribed taxa form a small, tightly-knit species group, the wider affinities of which are uncertain.

## Taxonomy

***Leucopogon audax*** Hislop, *sp. nov.*

*Typus*: east of Pingelly, Western Australia [precise locality withheld for conservation reasons], 22 August 2010, M. Hislop 4048 (*holo*: PERTH 08327491; *iso*: CANB, K, MEL, NSW).

*Leucopogon sp.* Tutanning (K. Kershaw 2132), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au> [accessed 11 April 2014].

Erect, open *shrubs* to *c.* 150 cm high and 120 cm wide, single-stemmed at ground level with a fire-sensitive rootstock. Young *branchlets* with a dense indumentum of straight,  $\pm$  patent hairs to *c.* 0.4 mm long, but mostly  $< 0.15$  mm. *Leaves* helically arranged, steeply antrorse, narrowly ovate to ovate, 3.5–14 mm long, 2.2–4.7 mm wide; apex acute or subacute; base broad, cuneate to rounded; petiole very obscure to well-defined, 0.1–0.7 mm long, either shortly hairy throughout or the abaxial surface glabrous; lamina 0.2–0.3 mm thick, adaxially concave, incurved along the longitudinal axis; surfaces  $\pm$  concolorous; adaxial surface with a moderately dense or dense indumentum of short, patent hairs, with 3–5 slightly raised veins usually evident or sometimes the venation very obscure; abaxial surface glabrous and shiny or more frequently with an indumentum similar to that of the adaxial surface and with 5–7 slightly sunken to slightly raised veins evident, the midrib rather thicker than the others; margins either irregularly ciliate with soft hairs to *c.* 0.5 mm long or  $\pm$  glabrous. *Inflorescences* erect, terminal and upper-axillary; axis 5–18 mm long with 3–13 flowers; axis indumentum of dense, patent hairs, 0.1–0.3 mm long; flowers erect, sessile or the lowest within an inflorescence shortly pedicellate below the bracteoles. *Fertile bracts* narrowly ovate to ovate, acute or subacute. *Bracteoles* ovate, 2.0–2.8 mm long, 1.2–1.7 mm wide, acute or subacute, keeled; abaxial surface shortly hairy throughout, or occasionally towards the base only; margins ciliate. *Sepals* ovate to narrowly ovate, 3.0–4.0 mm long, 1.5–2.0 mm wide, mostly subacute to acute, occasionally obtuse; abaxial surface usually shortly, and sparsely to densely hairy throughout, central portion greyish green, suffused purple towards the apex and in a submarginal band, becoming scarious towards the margins, the venation usually obscure except for the midvein; margins ciliate with hairs 0.08–0.2 mm long. *Corolla tube* white, broadly campanulate, distinctly shorter than sepals, 1.4–1.8 mm long, 1.6–2.1 mm wide,

glabrous externally and internally. *Corolla lobes* white or partially flushed pink, much longer than the tube (ratio = 2.0–2.9: 1), widely spreading from the base and recurved, 3.5–4.4 mm long, 1.0–1.2 mm wide at base, glabrous externally (or very occasionally sparsely hairy), densely bearded internally; indumentum white, 1.0–1.4 mm long near apex. *Anthers* partially exerted from tube (by *c.* 3/4 of their length), 2.1–2.7 mm long, prominently recurved towards the apex; sterile tip conspicuous, white, 0.8–1.2 mm long. *Filaments* terete, 0.9–1.2 mm long, attached 1/2–2/3 above anther base, adnate to tube just below the sinuses. *Ovary* depressed-globose or depressed-obovoid, 0.7–1.0 mm long, 0.8–1.1 mm wide, densely hairy in the lower half, glabrous above, (4)5-locular. *Style* 0.6–0.9 mm long, abruptly differentiated from the ovary apex, included within the corolla tube; stigma not or scarcely expanded. *Nectary* annular, 0.3–0.5 mm long, entire or very shallowly lobed, glabrous. *Fruit* longer than the calyx, 3.7–4.4 mm long, 2.3–2.6 mm wide, cylindrical, hairy over most of its surface with a spreading indumentum, prominently grooved longitudinally; apex truncate, the shoulders  $\pm$  rounded; surface between the shoulder and the style base descending steeply; style persistent but concealed at maturity in a depression created by the steeply descending surface of the fruit apex. (Figures 1A, 2)

*Diagnostic characters.* Within the *L. pulchellus* group *L. audax* can be distinguished by the following character combination: a grey-hairy aspect; leaves adaxially concave and relatively broad (2.2–4.7 mm wide); at least the adaxial surface, but usually both surfaces, densely hairy with short, patent hairs; the abaxial surface more or less smooth to broadly and faintly grooved; relatively large floral parts (e.g. sepals 3.0–4.0 mm long and 1.5–2.0 mm wide) and fruit (i.e. 3.7–4.4 mm long and 2.3–2.6 mm wide); a densely hairy, (4)5-locular ovary.

*Other specimens examined.* WESTERN AUSTRALIA: [localities withheld for conservation reasons] 21 Aug. 1986, A.R. Chapman 333, J.M. Powell & A.J.G. Wilson (NSW, PERTH); 1 Nov. 2007, T. Erickson TEE 204 (K, PERTH); 15 Sep. 1984, D.B. Foreman 719 (MEL, NSW, PERTH); 10 Oct. 1998, A.G. Gunness *et al.* NYAM 9/05 (PERTH); 5 Nov. 1998, A.G. Gunness *et al.* NYAM 13/09 (PERTH); 8 Sep. 2002, M. Hislop 2754 (CANB, MEL, NSW, PERTH); 22 Aug. 2010, M. Hislop 4046 (CANB, K, NSW, PERTH); 22 Aug. 2010, M. Hislop 4047 (CANB, PERTH); 26 Aug. 2005, F. Hort & J. Hort FH 2597 (CANB, PERTH); 31 Aug. 1997, G.J. Keighery & N. Gibson 5601 (CANB, PERTH); 9 Oct. 2000, K. Kershaw 2132 (NSW, PERTH); 17 Dec. 1965, P.G. Wilson 3946 (MEL, PERTH).

*Distribution and habitat.* *Leucopogon audax* has a restricted distribution in the Brookton–Pingelly district (Figure 3) in the west of the Avon Wheatbelt bioregion (Department of the Environment, Water, Heritage and the Arts 2008). It occurs mostly on lateritic, upland sites (one collection records it growing over a granitic substrate) in heath or open *Eucalyptus accedens* or *E. drummondii* woodland.

*Phenology.* The main flowering period is between August and October. Fruiting collections have been made in November and December.

*Etymology.* From the Latin *audax* (bold), an oblique reference to the tall habit and conspicuous, large flowers of the new species.

*Conservation status.* Department of Parks and Wildlife Conservation Codes for Western Australian Flora: Priority Two (Smith 2013), as *L. sp.* Tutanning (K. Kershaw 2132). *Leucopogon audax* is a short-range endemic currently known to occur in two nature reserves. The other populations are on private property.

*Affinities.* Within its limited geographical range *L. audax* is unlikely to be confused with other members



Figure 2. *Leucopogon audax*. Photograph of flowering branchlet from *M. Hislop* 4046. Scale bar = 2 cm.

of the genus, although another two species from the *L. pulchellus* group, *L. oldfieldii* Benth. and *L. darlingensis* Hislop (described below), often share a similar grey-hairy aspect. The distribution of *L. darlingensis* approaches that of *L. audax* closely to the west, but there are no records of the two occurring in sympatry. Foliar characters provide the most obvious means by which the two can be distinguished from one another. *Leucopogon darlingensis* has leaves with recurved or revolute margins and an abaxial surface that is grooved between the raised veins whereas in *L. audax* the leaves are flat or concave adaxially and more or less smooth abaxially. The very variable *L. oldfieldii* of the Geraldton Sandplains bioregion usually has a 3(4)-locular ovary, longer ovarian hairs and leaves which are usually deeply grooved abaxially.

***Leucopogon corymbiformis* Hislop, *sp. nov.***

*Typus*: Cape Arid National Park, Western Australia [precise locality withheld for conservation reasons], 20 August 2012, *M. Hislop* 4227 (*holo*: PERTH 08382093; *iso*: CANB, K, MEL, NSW).

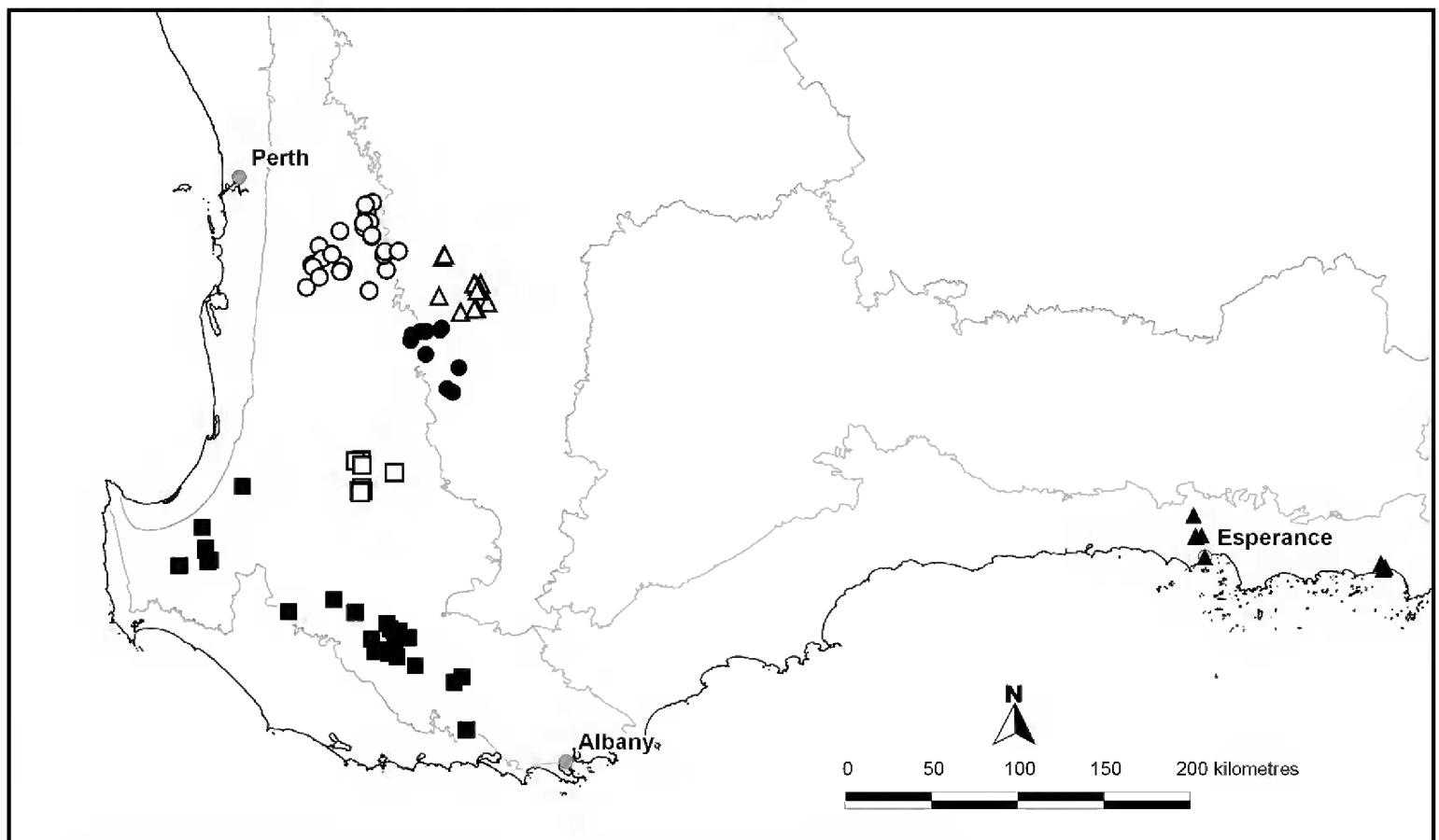


Figure 3. Distribution of *Leucopogon audax* ( $\Delta$ ), *L. corymbiformis* ( $\blacktriangle$ ), *L. darlingensis* subsp. *darlingensis* ( $\circ$ ), *L. darlingensis* subsp. *rectus* ( $\bullet$ ), *L. decrescens* ( $\blacksquare$ ) and *L. subsejunctus* ( $\square$ ) in Western Australia.

*Leucopogon* sp. Cape Arid (M. Paxman 50), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au> [accessed 11 April 2014].

Erect *shrubs* to c. 70 cm high and 70 cm wide, but usually less, single-stemmed at ground level with a fire-sensitive rootstock. Young *branchlets* glabrous. *Leaves* helically arranged, antrorse, usually steeply so, mostly narrowly elliptic to narrowly obovate, occasionally narrowly ovate, 3.0–7.5 mm long, 1.0–1.8 mm wide; apex usually acute or subacute, occasionally obtuse; base attenuate to cuneate; petiole usually well-defined, 0.3–0.8 mm long, glabrous on abaxial surface and margins, shortly and sparsely hairy on the adaxial surface; lamina 0.20–0.35 mm thick, usually convex adaxially, less often flat or slightly concave,  $\pm$  straight or incurved along the longitudinal axis; surfaces  $\pm$  concolorous; adaxial surface glabrous or very sparsely hairy towards the base, the venation not evident; abaxial surface glabrous, with 3–5 raised primary veins and distinct grooves between, the midrib rather thicker than the others; margins glabrous or coarsely ciliate, at least in the upper half, with antrorse hairs to c. 0.08 mm long. *Inflorescence* erect, terminal and upper-axillary; axis glabrous, 4–9 mm long with 3–12 flowers; flowers erect and pedicellate below the bracteoles for 0.8–3.0 mm. *Fertile bracts* narrowly ovate, acute. *Bracteoles* ovate, 1.1–1.5 mm long, 0.8–1.0 mm wide, obtuse to acute, keeled; abaxial surface glabrous, often  $\pm$  papillose; margins ciliate. *Sepals* narrowly ovate to ovate, 1.6–2.5 mm long, 0.7–1.1 mm wide, subacute or obtuse and then usually minutely apiculate; abaxial surface mostly glabrous and  $\pm$  papillose, sometimes very shortly hairy, central portion green or grey  $\pm$  suffused purple towards the apex and in a submarginal band, becoming scarious towards the margins, the venation usually rather prominent with 3–5 veins evident towards the apex; margins ciliate with hairs 0.05–0.15 mm long. *Corolla tube* white, campanulate, shorter than the sepals, 1.2–1.6 mm long, 1.2–1.4 mm wide, glabrous externally and internally. *Corolla lobes* white, sometimes partially flushed pink, longer than the tube (ratio = 1.3–1.8: 1), widely spreading from the base and recurved, 1.8–2.4 mm long, 0.6–0.9 mm wide at base, glabrous externally, densely bearded internally; indumentum white, 0.6–0.8 mm long near apex. *Anthers* partially exserted from the tube (by 1/2–2/3 of their length), 1.2–1.5 mm long, rather shallowly recurved towards apex; sterile tip moderately conspicuous, pale,

0.4–0.6 mm long. *Filaments* terete, 0.3–0.5 mm long, attached 1/2–2/3 above anther base, adnate to tube just below sinuses. *Ovary* globose, 0.45–0.55 mm long, 0.45–0.55 mm wide, obscurely lobed, glabrous, except for six short, longitudinal bands or tufts of hair, occasionally entirely glabrous, 3(4)-locular. *Style* 0.4–0.6 mm long, tapering smoothly from ovary apex, included within corolla tube; stigma not or scarcely expanded. *Nectary* annular, 0.3–0.4 mm long, entire or shallowly lobed, glabrous. *Fruit* much longer than calyx, 2.5–3.0 mm long, 1.1–1.3 mm wide, shortly cylindrical or obovoid, deeply lobed with lobes that are well-separated in the distal half but  $\pm$  converge towards the base, shortly hairy in two longitudinal bands along the lateral surfaces of each lobe (but presumably sometimes entirely glabrous); surface between the lobes and the style base descending steeply; style persistent. (Figure 1B, 4)

*Diagnostic characters.* Within the *L. pulchellus* group, *L. corymbiformis* can be distinguished by the following character combination: glabrous inflorescence axes; pedicellate flowers; deeply lobed fruit.

*Other specimens examined.* WESTERN AUSTRALIA: [localities withheld for conservation reasons] 9 Sep. 1966, *E.M. Bennett* 809 (PERTH); 10 May 2004, *D.J. Edinger & G. Marsh* DJE 4108 (PERTH); 1 Sep. 1962, *C.A. Gardner* 14112 (PERTH); 20 Aug. 2012, *M. Hislop* 4226 (CANB, MEL, NSW, PERTH); 20 Aug. 2012, *M. Hislop* 4228 (CANB, NSW, PERTH); 12 Oct. 2000, *G.J. Keighery & N. Gibson* 5076 (PERTH); 11 Aug. 1993, *M. Paxman* 50 (PERTH); 18 July 1982, *J.M. Powell* 1849B (CANB, K, NSW, PERTH); 11 Aug. 2006, *C.D. Turley* 21/806 (CANB, NSW, PERTH); 11 Aug. 2006, *C.D. Turley* 124/806 (CANB, PERTH); 12 Sep. 1964, *P.G. Wilson* 3031 (AD, PERTH).

*Distribution and habitat.* This species has an apparently disjunct distribution within the Esperance Plains bioregion (Department of the Environment, Water, Heritage and the Arts 2008). Apart from an old collection with the vague locality of ‘Esperance’ all specimens at the Western Australian Herbarium were either collected from an area about 20 to 30 km north of Esperance or from Cape Arid National Park (Figure 3). There is also an unvouchered record from the Mount Merivale area about 20 km east of Esperance (W. Archer pers. comm.). *Leucopogon corymbiformis* grows on sandplain or sub-coastal dunes in *Banksia* woodland or heath. Commonly associated species include *Banksia speciosa*, *Adenanthos cuneatus*, *Melaleuca striata*, *M. scabra* and *Agonis baxteri*.

*Phenology.* The main flowering period is between July and September. The only specimen with mature fruit was collected in the second week of October.

*Etymology.* From the Latin *corymbus* (a cluster of flowers) and *-formis* (-formed); having an inflorescence with the general appearance of, but not necessarily the structure of, a true corymb. This is a reference to the inflorescence of this species which is an unusual one for the genus, in that the flowers are pedicellate with the pedicels becoming progressively shorter towards the top of the inflorescence.

*Conservation status.* Department of Parks and Wildlife Conservation Codes for Western Australian Flora: recently listed as Priority Two under the name *L. sp.* Cape Arid (M. Paxman 50) (Western Australian Herbarium 1998–). There is still some doubt at this stage whether the apparent disjunction in the range of this species is real or an artifact of inadequate collecting between Esperance and Cape Arid. The recent unvouchered record from south of Mount Merivale may be an indication that it is the latter, however the fact that there are no records from the generally well-collected Cape Le Grand National Park is probably significant and even at Cape Arid National Park its distribution appears to be rather patchy.

*Affinities.* This is a distinctive, uniform species the closer affinities of which are problematic. It is

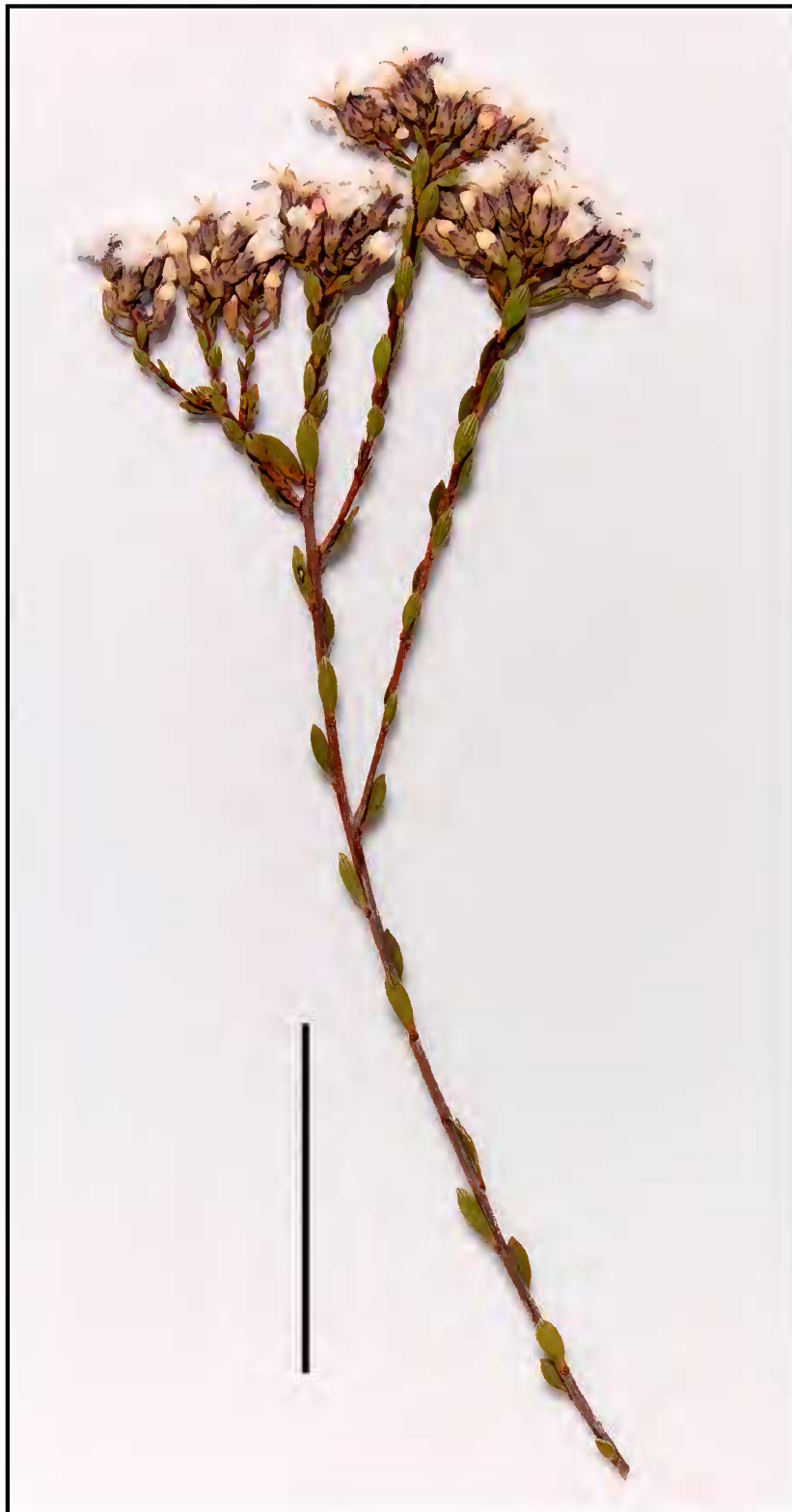


Figure 4. *Leucopogon corymbiformis*. Photograph of flowering branchlet from M. Hislop 4226. Scale bar = 2 cm.

easily recognised by three unusual characters: clearly pedicellate flowers, distinctively lobed fruit and glabrous inflorescence axes. Although *L. subsejunctus* Hislop is similar in having a lobed fruit, it has the lobes separated by deep, narrow grooves for the entire length of the drupe whereas in *L. corymbiformis* the lobes are widely separated in the distal half and converge toward the base. This, together with the other unusual features of *L. corymbiformis* mentioned above, which are absent from *L. subsejunctus*, suggests that the two are unlikely to be particularly close relatives.

***Leucopogon darlingensis* Hislop, *sp. nov.***

*Typus*: Wills Nature Reserve, Bartram Road, Brookton, 3.9 km north of Brookton Highway or 100 m south of Wills Road, Western Australia, 24 September 2005, F. & J. Hort 2618 (*holo*: PERTH07189613; *iso*: CANB, NSW).

*Leucopogon* sp. Darling Range (F. & J. Hort 1804), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au> [accessed 11 April 2014].

Erect *shrubs* to *c.* 1.2 m high and 1.5 m wide, single or multi-stemmed at ground level and at least sometimes with a fire-tolerant rootstock. Young *branchlets* with a moderately dense to dense indumentum, comprising either uniformly crisped hairs, uniformly straight hairs or a mixture of crisped and  $\pm$  straight hairs, the longest to *c.* 0.5 mm long. *Leaves* helically arranged, usually variously antrorse, occasionally patent to shallowly retrorse, linear, oblong, narrowly elliptic or narrowly ovate, 5–18 mm long, 0.7–3.5 mm wide; apex acute to subacute; base attenuate; petiole obscure to moderately well-defined, 0.3–0.8 mm long, hairy throughout; lamina 0.3–0.5 mm thick, curvature variable, adaxial surface convex with the margins varying from slightly recurved with the abaxial surface visible throughout to revolute and with the abaxial surface completely concealed, longitudinal axis  $\pm$  incurved in the upper half, less often straight; surfaces discoloured; adaxial surface shiny, sparsely to densely hairy with curved or crisped hairs, sometimes glabrescent, the venation not evident; abaxial surface shiny or not, usually moderately to densely hairy (occasionally sparsely hairy only), with 3–7 primary veins, grooved, often deeply so, between the veins, the midrib distinctly thicker than the others; margins usually irregularly ciliate, with hairs to *c.* 1 mm long, less often  $\pm$  glabrous. *Inflorescence* erect, terminal and upper-axillary; axis 6–12 mm long with 2–10 flowers; axis indumentum dense, of crisped and straight hairs, 0.1–0.3 mm long; flowers erect and sessile. *Fertile bracts* narrowly ovate, acute. *Bracteoles* ovate to narrowly ovate, 1.1–3.2 mm long, 0.9–1.8 mm wide, acute or acuminate, keeled; abaxial surface hairy throughout; margins ciliate. *Sepals* ovate to narrowly ovate, 2.4–4.2 mm long, 1.1–2.0 mm wide, acute, subacute or obtuse; abaxial surface variously hairy throughout, central portion pale green,  $\pm$  suffused purple towards the apex and in a submarginal band, becoming scarious towards the margins at least in the lower half, the midrib often prominent, the other venation obscure; margins ciliate with hairs 0.08–0.50 mm long. *Corolla tube* white, broadly campanulate, much shorter than the sepals, 1.1–2.0 mm long, 1.1–2.2 mm wide, glabrous externally and internally. *Corolla lobes* white, much longer than tube (ratio = 2–3.5: 1), widely spreading from base and recurved, 3.0–4.7 mm long, 0.7–1.2 mm wide at base, glabrous externally or very occasionally sparsely hairy, densely bearded internally; indumentum white, 1.0–1.4 mm long near apex. *Anthers* partially exerted from tube (by 3/4–7/8 of their length), 1.7–3.1 mm long, prominently recurved towards the apex; sterile tip conspicuous, white, 0.6–1.0 mm long. *Filaments* terete, 0.5–1.5 mm long, attached 1/2–2/3 above anther base, adnate to tube just below sinuses. *Ovary* ellipsoid to globose, 0.7–1.0 mm long, 0.6–0.8 mm wide, usually appressed-hairy in the lower half, occasionally glabrous, (4)5-locular. *Style* 0.4–1.0 mm long, usually well-differentiated from ovary apex, included within corolla tube; stigma not or scarcely expanded. *Nectary* annular, 0.3–0.5 mm long, shallowly lobed, glabrous, sometimes completely enveloping the ovary. *Fruit* usually distinctly longer than, but occasionally  $\pm$  equal to, the calyx, 3.2–4.2 mm long, 1.6–2.0 mm wide, cylindrical or narrowly ellipsoid, usually variously hairy, occasionally glabrous, usually longitudinally grooved; apex truncate, the shoulders angular to  $\pm$  rounded; surface between the shoulder and the style base flat or descending gently; style usually persistent.

*Diagnostic characters.* Within the *L. pulchellus* group, *L. darlingensis* can be distinguished by the following character combination: a usually grey-hairy aspect; narrow adaxially convex leaves with recurved to revolute margins; at least the abaxial surface, but usually both surfaces, variously hairy; the abaxial surface grooved; a usually hairy (occasionally glabrous), (4)5-locular ovary.

*Etymology.* The species is named for its occurrence in the Darling Range.

*Affinities.* The only other described species from Group C that has prominently recurved to revolute leaf margins is *L. rubricaulis* R.Br. from southern near-coastal districts between Cheyne Beach and

Broke Inlet. That species is easily distinguished by its more or less smooth, usually glabrous abaxial leaf surfaces (grooved and always hairy in *L. darlingensis*) and sepals that are glabrous or very shortly hairy and obtuse or subacute (*cf.* always hairy, usually densely so and acute to subacute). In addition, the ovarian hairs in *L. rubricaulis* are always very short and restricted to the apex whereas in *L. darlingensis* the hairs begin some way below the apex and are usually longer.

*Notes.* The German botanist Alfred Meebold apparently made the first collection of this species in June of 1933. However it may well be that the ‘Parkerville’ locality given for that specimen is approximate only. All subsequent collections have been made well to the south and east of the Parkerville area.

Two apparently allopatric subspecies are recognised, based on indumentum and minor floral differences.

### Key to subspecies of *Leucopogon darlingensis*

1. Branchlet and foliar indumentum composed of uniformly crisped hairs,  
or of a mixture of crisped and  $\pm$  straight hairs; marginal hairs crinkled at least in  
upper half of sepals; corolla lobe width 0.9–1.2 mm; filaments  
0.9–1.5 mm long (SW of York south to North Bannister and Wandering) ..... subsp. **darlingensis**
- 1: Branchlet and foliar indumentum composed of  $\pm$  straight hairs only;  
sepal marginal hairs straight throughout; corolla lobe width 0.7–1.0 mm;  
filaments 0.5–1.0 mm long (Dryandra Woodland–Williams–Highbury) ..... subsp. **rectus**

### *Leucopogon darlingensis* Hislop subsp. **darlingensis**

Young *branchlets* either with a uniform indumentum of crisped hairs or a mixture of crisped and  $\pm$  straight hairs. *Leaves* 0.7–2.0 mm wide; both surfaces sparsely to densely hairy, either with crisped hairs throughout or a mixture of crisped and  $\pm$  straight hairs. *Sepals* 1.4–2.0 mm wide, the margins ciliate with crinkled hairs throughout or at least in the upper half. *Corolla lobes* 0.9–1.2 mm at base. *Filaments* 0.9–1.5 mm long. (Figure 1C, 5)

*Other specimens examined.* WESTERN AUSTRALIA: Dale West Rd, 1.3 km E of Brookton Hwy, NW of Brookton, 3 Sep. 2000, *M. Hislop* 2121 (CANB, PERTH); base of SW slopes of Mt Cooke, 28 Aug. 2004, *M. Hislop* 3306 (CANB, PERTH); [Woodland Watch] site 235, [private property] W side of Hillcroft Rd between Dale Rd South and Groves Rd, W of Brookton, 1 Sep. 2008, *M. Hislop & M. Griffiths* WW 235-8 (MEL, NSW, PERTH); [Woodland Watch] site 236, [private property] E side of Butchers Rd between Vallentine and Wills Rds, W of Brookton, 1 Sep. 2008, *M. Hislop & M. Griffiths* WW 236-9 (CANB, PERTH); SW of junction of Watershed Rd and McCallum Rd, Gibbs State Forest, Shire of Wandering, 29 July 1999, *F. Hort* 526 (CANB, NSW, PERTH); Wandoo Conservation Park, S of Dale West Rd, Shire of Beverley, [Dale West Rd 5.8 km E of Dobaderry Rd then SW along forest E boundary], 5 Aug. 1999, *F. Hort* 528 (NSW, PERTH); Canning River Rd, Wandering: 1.3 km S of Millars Log Rd – E of Mt Cooke, 21 Aug. 2002, *F. & J. Hort* 1804 (CANB, MEL, NSW, PERTH); Gunapin Ridge, Qualen Rd, York, 25 Aug. 2003, *F. Hort* 1999 (MEL, PERTH); proposed Wandoo National Park, Catchment Rd, Beverley. On hilltop and N slopes *c.* 5.8 km N of Dobaderry Rd, 11 Sep. 2003, *F. Hort & G. Harders* 2032 (K, PERTH); Reserve 4328, Rigoll Rd Beverley, 2.4 km SSE of Dobaderry Rd, 11 Sep. 2003, *F. Hort* 2034 (CANB, PERTH); Edison Mill Rd, Beverley, *c.* 5.5 km E of Dobaderry Rd then S along the E boundary of the proposed Wandoo National Park, *c.* 1 km from the SE corner of the park, 11 Sep. 2003, *F. Hort* 2036 (NSW, PERTH); Gibbs State Forest, Metro Rd, Wandering: 3 km S of Division Track, 6 Nov. 2003, *F. Hort* 2086 (CANB, NSW, PERTH); Lupton Conservation Park, Brookton, from Perimeter Rd at SW corner of PP Loc. 16674 ENE along boundary



Figure 5. *Leucopogon darlingensis* subsp. *darlingensis*. Photograph of flowering branchlet from *F. Hort* 526. Scale bar = 2 cm.

track for 2.9 km then 200 m SE, 10 Aug. 2005, *F. Hort* 2552 (MEL, PERTH); Albany Hwy, Wandering, W side of Hwy 1.1 km S of Pike Rd, 10 Sep. 2005, *F. & J. Hort* 2615 (CANB, PERTH); Wearne State Forest, Ricks Rd, 2.5 km directly WNW from the junction with Heartbreak Rd, Wandering, 28 Aug. 2010, *F. & J. Hort* 3687 (CANB, MEL, PERTH); near North-East Rd, 7.3 km of Muja powerline crossing [NW of North Bannister], 10 Aug. 1993, *K. McDougall* 219 (PERTH).

*Distribution and habitat.* Apparently endemic to the eastern Darling Range, extending from southwest of York to the North Bannister and Wandering areas (Figure 3) in the Northern Jarrah Forest and western edge of the Avon Wheatbelt bioregions (Department of the Environment, Water, Heritage and the Arts 2008). Occurs in sandy or light loam soils, on lateritic uplands, and in association with woodlands dominated by *Eucalyptus marginata*, *E. wandoo*, *E. accedens* and *Corymbia calophylla*.

*Phenology.* Peak flowering is in August and September. Fruiting collections have been made in October and November.

*Conservation status.* Although not having a particularly wide distribution, it is a locally common plant in a part of the state which is still, in large part, covered in natural vegetation. It is well represented in the reserve system with most of the other populations in state forest. No conservation coding is recommended here.

***Leucopogon darlingensis*** Hislop subsp. **rectus** Hislop, *subsp. nov.*

*Typus:* Dryandra Woodland, north-west of Narrogin, Western Australia [precise locality withheld for conservation reasons], 23 August 2012, *M. Hislop* 4235 (*holo:* PERTH 08549915; *iso:* CANB, K, MEL, NSW).

Young *branchlets* with an indumentum of  $\pm$  straight hairs only, these often of mixed lengths. *Leaves* 1.0–3.5 mm wide; both surfaces usually densely hairy with  $\pm$  straight hairs. *Sepals* 1.1–1.6 mm wide, the margins ciliate with straight hairs throughout. *Corolla lobes* 0.7–1.0 mm at base. *Filaments* 0.5–1.0 mm long.

*Diagnostic characters.* Distinguished from the typical subspecies by its uniformly straight hairs on branchlets, leaves and sepal margins, generally narrower sepals and corolla lobes and shorter filaments.

*Other specimens examined.* WESTERN AUSTRALIA: [localities withheld for conservation reasons] 8 Sep. 2001, *J. Foss & P. Gurry* 53 (PERTH); 24 Oct. 1991, *W. Greuter* 23196 (PERTH); 22 Aug. 2012, *M. Hislop* 4232 (CANB, NSW, PERTH); 22 Aug. 2012, *M. Hislop* 4233 (CANB, PERTH); 23 Aug. 2012, *M. Hislop* 4234 (NSW, PERTH); 18 Sep. 2012, *M. Hislop* 4240 (CANB, NSW, PERTH); 6 Oct. 2013, *M. Hislop* 4288 (CANB, NSW, PERTH); 11 Aug. 2004, *F. Hort & B. Hort* 2293 (CANB, NSW, PERTH); 8 Sep. 1983, *G.J. Keighery* 6572 (PERTH); 2 Oct. 1994, *T.R. Lally* 400 (CANB, PERTH); 5 Aug. 1987, *D. Rose* 90 (PERTH); 9 Aug. 1999, *G. Warren, C. Taylor & P. Rose* 272 (PERTH); 15 Sep. 2000, *G. Warren & P. Rose* 272B (PERTH).

*Distribution and habitat.* This taxon has a restricted distribution between Williams, Dryandra Woodland and the Highbury area (Figure 3) in the Avon Wheatbelt and eastern edge of the Northern Jarrah Forest bioregions (Department of the Environment, Water, Heritage and the Arts 2008). Its favoured habitat of open woodland on lateritic uplands is very much the same as that of the typical subspecies and indeed is a common one for species across Group C.

*Phenology.* As for the typical subspecies.

*Etymology.* From the Latin *rectus* (straight), referring to the straight hairs of the branchlets, leaves and sepals of this taxon.

*Conservation status.* Department of Parks and Wildlife Conservation Codes for Western Australian Flora: to be listed as Priority Two (A. Jones pers. comm.). *Leucopogon darlingensis* subsp. *rectus* is locally common across its restricted range and most populations are conserved in nature reserves or state forest.

*Notes.* The two subspecies of *L. darlingensis* are presumed to be allopatric. The closest that they

are known to approach each other is about 40 km. Two specimens collected from west of Bannister (*J. Freeman* JF 007 and *T. Laslett* TL 189), a little to the south of the known distribution of the typical subspecies, do not well fit within this infraspecific classification. The vegetative indumentum is like that of subsp. *rectus* however the sepal indumentum is more similar to that of the typical subspecies. The abaxial leaf surface is unusual for the species as a whole, in having very few hairs and in being unusually broadly and shallowly grooved. The diagnostic floral characters are intermediate between the two. Although this population in some ways blurs the boundaries between the two subspecies, *L. darlingensis* is a well collected species and the large specimen base is otherwise supportive of the recognition of two taxa.

***Leucopogon decrescens* Hislop, *sp. nov.***

*Typus*: south side of Muirs Highway, 1.1 km west of Perillup Road, east of Rocky Gully, Western Australia, 24 August 2008, *M. Hislop* 3820 (*holo*: PERTH 08083223; *iso*: CANB, MEL, NSW).

*Leucopogon* sp. Darradup (R.D. Royce 2998), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au> [accessed 11 April 2014]; G. Paczkowska & A.R. Chapman, *West. Aust. Fl.: Descr. Cat.*: 240 (2000); J. Wheeler, N. Marchant & M. Lewington, *Fl. South West* 2: 600 (2002).

Erect, open *shrubs* to *c.* 70 cm high and 70 cm wide, single-stemmed at ground level with a fire-sensitive rootstock. Young *branchlets* with a variable indumentum of straight, curled and/or crisped hairs to *c.* 0.5 mm long. *Leaves* helically arranged, steeply antrorse to antrorse-appressed, usually narrowly ovate, less often ovate, 2.0–7.2 mm long, 0.9–1.6 mm wide; apex variable, usually acute or subacute, occasionally acuminate or obtuse; base broad, cuneate; petiole  $\pm$  absent or to *c.* 0.2 mm long, if present then usually hairy to some degree; lamina 0.15–0.25 mm thick, concave adaxially, incurved along the longitudinal axis; surfaces  $\pm$  concolorous; adaxial surface with a moderately dense to dense indumentum of mostly straight, patent to antrorse hairs, the venation obscured by hairs; abaxial surface with a sparse to moderately dense indumentum, which sometimes becomes abraded on older leaves leaving the surface verrucose, or occasionally glabrous, with 5–7 primary veins, these usually flat or occasionally slightly raised causing the surface to be shallowly grooved between the veins, the midrib thicker than the others; margins irregularly ciliate with hairs to 0.5 mm long. *Inflorescence* erect, terminal and upper-axillary; axis 4–10 mm long with 4–11 flowers; axis indumentum of dense patent to shallowly antrorse hairs 0.2–0.5 mm long; flowers erect and sessile. *Fertile bracts* narrowly ovate, acute. *Bracteoles* narrowly ovate, 1.5–2.5 mm long, 0.8–1.0 mm wide, acute to acuminate, sharply keeled; abaxial surface with spreading hairs; margins ciliate. *Sepals* ovate or narrowly ovate, 2.3–3.0 mm long, 1.0–1.4 mm wide, acute, subacute or obtuse; abaxial surface usually hairy in the upper half with an indumentum of loose, antrorse hairs, or very occasionally  $\pm$  glabrous, central portion pale greyish green, suffused purple in the upper half, becoming scarious towards the margins, the venation rather obscure with only the midrib evident; margins ciliate with hairs 0.1–0.4 mm long. *Corolla tube* white, campanulate or broadly campanulate, distinctly shorter than sepals, 1.2–1.7 mm long, 1.2–1.5 mm wide, glabrous externally and internally. *Corolla lobes* white throughout, or more often partially flushed pink, longer than the tube (ratio = 1.3–2.6: 1), widely spreading from the base and recurved, 2.0–3.2 mm long, 0.7–0.8 mm wide at base, glabrous externally, densely bearded internally; indumentum white, 0.8–1.2 mm long near apex. *Anthers* partially exserted from tube (by 3/4–7/8 of their length), 1.5–2.0 mm long, prominently recurved towards the apex; sterile tip conspicuous, white, 0.4–0.6 mm long. *Filaments* terete, 0.5–0.9 mm long, attached 2/3–3/4 above anther base, adnate to tube just below the sinuses. *Ovary* globose or depressed-globose, 0.5–0.7 mm long, 0.6–0.8 mm wide, usually appressed-hairy, or very occasionally glabrous, (3)4–5-locular. *Style* 0.4–0.7 mm long, usually well-differentiated from ovary apex, included within the corolla tube; stigma not or scarcely

expanded. *Nectary* annular, 0.25–0.40 mm long, entire to shallowly lobed, glabrous. *Fruit* about the same length to somewhat longer than the calyx, 1.8–2.8 mm long, 1.2–1.7 mm wide, shortly cylindrical, from slightly to distinctly angular in section, usually rather densely hairy, very occasionally glabrous; apex truncate with angular shoulders; surface between the rim and the style base flat or descending gently; style persistent. (Figures 1D, 6)

*Diagnostic characters.* Within the *L. pulchellus* group, *L. decrescens* can be distinguished by the following character combination: leaves adaxially concave and incurved, steeply antrorse to antrorse-appressed, usually narrowly ovate (0.9–1.6 mm wide); the adaxial surface hairy, usually densely so, with a variable indumentum of patent to antrorse hairs; the abaxial surface more or less smooth to broadly and faintly grooved; a usually densely hairy, (3)4- or 5-locular ovary (1.8–3.0 mm long and 1.2–1.7 mm wide).

*Other specimens examined.* WESTERN AUSTRALIA: Corbalup Rd, 700 m N of Seaton Ross Rd [E of Manjimup], 15 Sep. 1993, *A.R. Annels* ARA 3670 (NSW, PERTH); Lake Unicup, 13 Aug. 1999, *R.J. Cranfield* 13834 (PERTH); Boarding House Rd, 4.3 km N of Mowen Rd, W of Nannup, 26 Nov. 2006, *M. Hislop* 3684 (CANB, NSW, PERTH); N side of Wingebellup Rd, 6.6 km E of Mordalup Rd, W of Frankland, 23 Aug. 2008, *M. Hislop* 3818 (CANB, NSW, PERTH); S side of Muirs Hwy, 1.1 km W of Perillup Rd, E of Rocky Gully, 14 Nov. 2009, *M. Hislop* 3969 (CANB, NSW, PERTH); Northern Rd, 9.8 km N of Mordalup Rd, SE of Manjimup, 15 Nov. 2009, *M. Hislop* 3984 (CANB, NSW, PERTH); Galamup Nature Reserve, W of Rocky Gully between Muirs Hwy and first internal firebreak, 12 Sep. 2010, *M. Hislop* 4068 (CANB, MEL, PERTH); Lake Muir Nature Reserve, Muirs Hwy, 2.9 km E of Nabacup Rd, W of Rocky Gully, 12 Sep. 2010, *M. Hislop* 4069 (CANB, MEL, NSW, PERTH); NE corner of Kulunilup Nature Reserve, off Wingebellup Rd, 2.5 km E of Unicup Rd, NW of Frankland, 13 Sep. 2010, *M. Hislop* 4072 (CANB, MEL, NSW, PERTH); Galamup Nature Reserve [W of Rocky Gully], 23 Oct. 1997, *G.J. Keighery & N. Gibson* 2352 (PERTH); Manjimup, 24 Oct. 1947, *R.D. Royce* 2361 (NSW, PERTH); Manjimup, 28 Sep. 1948, *R.D. Royce* 2727 (NSW, PERTH); 18 miles [c. 29 km] W of Nannup, 29 Oct. 1948, *R.D. Royce* 2998 (PERTH); c. 200 m S on creekline (S side), c. 2 km E of Stoate Rd on Mowen Rd [W of Nannup], 7 Sep. 2000, *L.W. Sage & A.E. Raudino* 2376 (CANB, PERTH); remnant bushland NW of corner Hay Loc. 2043, ITC Spring Valley Farm, c. 5.2 km SE of Muirs Bridge, Muirs Hwy, 14 Nov. 2003, *E.M. Sandiford* EMS 940 (PERTH).

*Distribution and habitat.* *Leucopogon decrescens* is distributed in a rather narrow east-west band from the Whicher Range in the west to between Rocky Gully and Mount Barker in the east (Figure 3). This places it in the Southern Jarrah Forest bioregion (Department of the Environment, Water, Heritage and the Arts 2008). It grows on sandy soils, very occasionally over laterite or granite, low in the landscape and often close to winter-wet sites. Associated vegetation is woodland or heath with the following species frequently dominant: *Eucalyptus decipiens*, *E. marginata*, *Melaleuca preissiana*, *M. thymoides*, *Banksia attenuata*, *B. littoralis*, *Pericalymma ellipticum* and *Taxandria parviceps*.

*Phenology.* Peak flowering is during the months of August and September, with maximum fruiting between October and November.

*Etymology.* From the Latin *decrescens* (diminishing, narrowing), in reference to the outline of the narrowly ovate leaves which in their typical form taper more or less smoothly from the widest point in the basal half to the acute apex. This highlights an often useful character which helps to distinguish it from related species.



Figure 6. *Leucopogon decrescens*. Photograph of flowering branchlet from M. Hislop 3820. Scale bar = 2 cm.

*Conservation status.* *Leucopogon decrescens* has a fairly wide regional distribution, is often locally common and is represented in a number of nature reserves. No conservation coding is recommended here.

*Affinities.* Older collections of this species have mostly been referred to *L. pulchellus* or *L. polymorphus*, and the latter is the most similar to *L. decrescens* in terms of its gross morphology. Reliable foliar differences provide the best means of distinguishing between the two. In *L. polymorphus* the leaves vary between narrowly ovate, narrowly elliptic and sometimes obovate (commonly even on the same plant), the abaxial leaf surface is deeply grooved and although both surfaces vary from conspicuously hairy to more or less glabrous, if they are obviously hairy then the adaxial surface is no more densely so than the abaxial. *Leucopogon decrescens* differs from this in mostly having narrowly ovate leaves (rarely ovate), with a smooth or occasionally shallowly grooved abaxial surface and a consistently

hairy adaxial surface which is always noticeably more densely hairy than the abaxial. The taxonomic significance of a relatively dense indumentum on the upper leaf surface of the kind seen in *L. decrescens* is discussed elsewhere (Hislop 2009b).

There is little to distinguish between the two species in terms of their floral morphologies, but whereas the flowers of *L. decrescens* almost always have hairy ovaries, in *L. polymorphus* they may be glabrous or hairy. The latter is unusual in the *L. pulchellus* group (and the genus as a whole) in that hairy or glabrous ovaries are more or less equally common. There is also at least a partial difference between the two species in the shape of the drupe. In *L. polymorphus* it is never more than obscurely angular in section but in *L. decrescens* the angularity may be quite pronounced. As discussed below *L. decrescens* is a variable species in regard to a number of characters and that includes the often significant one of fruit shape. The two species have allopatric distributions with *L. polymorphus* occurring mostly on the coastal plain from the Yalgorup-Waroona area north to near Leeman.

Although *L. pulchellus* is another very variable species it can always be distinguished from *L. decrescens* by the presence of a keel on the distal abaxial leaf surface, the usually flat or plano-convex leaves and the mostly glabrous ovaries. The consistently hairy adaxial leaf surface of *L. decrescens* provides another point of difference between the two species. *Leucopogon gracillimus* DC. bears some resemblance to those variants of *L. decrescens* with narrow leaves, and members of the *L. obtusatus* complex could be mistaken for those that have relatively short leaves. In both cases their glabrous, 3-locular ovaries will almost always distinguish them. Examples of sympatry in the *L. pulchellus* group are noteworthy and *L. decrescens* (M. Hislop 4071) was found growing in close proximity to *L. gracillimus* s. lat. (M. Hislop 4070) at a site west of Rocky Gully, where both species were locally common. Although the granitic substrate made it an unusual habitat for *L. decrescens*, the plants were typical of that species in all respects. There was no evidence of intergradation at the site.

*Notes.* As circumscribed here *L. decrescens* is a variable species, most obviously in leaf characters, and some of this variation has a geographical basis. The current specimen base suggests that there is a slight disjunction in the distribution of the species with a western population node in the valleys of the Whicher Range and a larger eastern node beginning 60 or 70 km to the east. In general plants from the western node tend to have smaller leaves which are glabrous, or at least less hairy, on their abaxial surface relative to those from the east. Also the leaf margins in the western form have very short, stiff hairs compared to the obviously ciliate margins of the type form. In addition a couple of western collections (e.g. *L. W. Sage & A. E. Raudino* 2376) are aberrant in regard to an often significant taxonomic character, having ovaries that are glabrous and 3-locular rather than hairy and 4- or 5-locular. Neither glabrous nor 3-locular ovaries were recorded from the eastern collections examined during this study.

Although there may therefore appear to be some grounds for the recognition of a second taxon, the overall pattern of variation across the species' range suggests that a broad circumscription is more appropriate, at least until further studies can be undertaken. Within the eastern node itself, there is considerable morphological variation. While the leaves are usually larger than those of the western node, occasional smaller-leaved populations do occur (see M. Hislop 4069). In their foliar character these differ from the western form only in having clearly ciliate margins as described above. In terms of potential difference in floral measurements there is more variation within the eastern node than between the two nodes.

Further targeted collections are needed to assess the significance of differences in the angularity of the fruit. Only one fruiting collection of the western form has been examined (M. Hislop 3684) and that was found to have obscurely angular drupes. Of the five fruiting collections from eastern

populations, three are distinctly angular and two have drupes comparable to *Hislop* 3684. However it may be significant that the latter were collected towards the western end of the eastern population node. Fruit of the type form is of the distinctly angular kind. In regard to the glabrous ovaries recorded in a couple of the western collections, although the presence of an ovarian indumentum is certainly taxonomically significant in Group C, there is reason to believe (as discussed above under general notes on the morphology of the group) that it may never be an absolutely consistent character for any species. Similarly, while locule number is undoubtedly an important character across *Leucopogon* s. str., it is rather less reliable in the *L. pulchellus* group than in the other groups.

***Leucopogon subsejunctus* Hislop, sp. nov.**

*Typus*: south-west of Darkan, Western Australia [precise locality withheld for conservation reasons], 13 November 2009, *M. Hislop* 3962 (*holo*: PERTH 08260214; *iso*: CANB, MEL, NSW).

*Leucopogon* sp. Darkan (R.S. Smith BNC 1047), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au> [accessed 11 April 2014].

Erect *shrubs* to c. 80 cm high and 80 cm wide, single-stemmed at ground level with a fire-sensitive rootstock. Young *branchlets* with a moderately dense to dense indumentum of straight, patent hairs to c. 0.1 mm long. *Leaves* helically arranged, variously antrorse, mostly narrowly ovate or narrowly elliptic, less often ovate, elliptic or narrowly obovate, 3.0–8.5 mm long, 1.0–2.5 mm wide; apex obtuse to acute; base attenuate to cuneate; petiole moderately well defined, 0.2–0.6 mm long, glabrous on abaxial surface, hairy on adaxial surface and margins; lamina 0.25–0.40 mm thick, usually flat or slightly concave adaxially, less often slightly convex, straight or more frequently recurved along the longitudinal axis; surfaces discoloured, shiny; adaxial surface usually glabrous or sparsely hairy towards the base, rarely sparsely hairy throughout, the venation not or barely evident; abaxial surface paler, glabrous, smooth to  $\pm$  striate, often at least with a groove on either side of the midrib, with 5–7 primary veins, the midrib rather thicker than the others, usually produced into an obvious keel, at least towards the apex; margins usually glabrous, less often minutely ciliolate with coarse hairs to c. 0.05 mm long. *Inflorescence* erect, terminal and upper-axillary; axis 3–12 mm long with 3–11 flowers; axis indumentum of dense, patent hairs 0.08–0.12 mm long; flowers erect and sessile. *Fertile bracts* narrowly ovate to ovate, subacute to acute. *Bracteoles* ovate, 1.5–2.0 mm long, 1.0–1.5 mm wide, obtuse to acute, sharply keeled; abaxial surface glabrous or very shortly hairy; margins ciliolate. *Sepals* ovate, 2.4–3.2 mm long, 1.3–1.5 mm wide, obtuse to subacute; abaxial surface glabrous or shortly hairy in the upper half, central portion pale greyish green, usually suffused purple towards the apex and in a submarginal band, becoming scarious towards the margins, venation rather obscure with only the midrib usually evident; margins ciliolate with hairs 0.05–0.10 mm long. *Corolla tube* white, campanulate or broadly campanulate, distinctly shorter than sepals, 1.2–1.5 mm long, 1.4–1.7 mm wide, glabrous externally and internally. *Corolla lobes* white, partially flushed pink, or pink throughout, much longer than tube (ratio = 1.7–2.7: 1), widely spreading from the base and recurved, 2.6–3.5 mm long, 0.8–1.0 mm wide at base, glabrous externally, densely bearded internally; indumentum white, 0.8–1.0 mm long near apex. *Anthers* partially exerted from the tube (by c. 7/8 of their length), 2.0–2.6 mm long, prominently recurved towards the apex; sterile tip conspicuous, white, 0.7–1.0 mm long. *Filaments* terete, 0.8–1.1 mm long, attached 1/2–2/3 above anther base, adnate to tube just below the sinuses. *Ovary* globose or broadly obovoid, 0.5–0.7 mm long, 0.5–0.7 mm wide, usually distinctly lobed, appressed hairy, the hairs sometimes short and sparse, 3–5-locular. *Style* 0.5–0.7 mm long, tapering  $\pm$  smoothly from ovary apex, included within corolla tube; stigma not or scarcely expanded. *Nectary* annular, 0.30–0.50 mm long, entire or shallowly lobed, glabrous. *Fruit* much longer than calyx, 2.6–3.0 mm long, 1.7–2.3 mm wide, shortly cylindrical, ellipsoid or obovoid,

deeply lobed, with as many lobes as fertilised ovules, the lobes with short, spreading hairs, separated by deep, narrow, longitudinal grooves; surface between the lobes and the style base descending steeply; style persistent. (Figures 1E, 7)

*Diagnostic characters.* The deeply lobed fruit is the most important feature by which this species can be distinguished from potentially confusing species within the *L. pulchellus* group. Other significant characters are: leaves abaxially keeled in the upper half and hairy, 3–5-locular ovaries.

*Other specimens examined.* WESTERN AUSTRALIA: [localities withheld for conservation reasons] 22 Aug. 1994, V. Crowley DKN 559 (PERTH); 16 Aug. 1993, V. Crowley DKN 561 (PERTH); 29 Aug. 2009, M. Hislop 3913 (CANB, NSW, PERTH); 30 Aug. 2009, M. Hislop 3918 (CANB, MEL, NSW, PERTH); 15 Nov. 2009, M. Hislop 3988 (CANB, PERTH); 6 Sep. 2010, M. Hislop 4061 (CANB, PERTH); 6 Sep. 2010, M. Hislop 4062 (CANB, MEL, NSW, PERTH); 23 Oct. 2010, M. Hislop 4094 (CANB, NSW, PERTH); 23 Oct. 2010, M. Hislop 4095 (NSW, PERTH); 27 Sep. 2006, R.S. Smith BNC 1047 (PERTH); 5 Sep. 1986, P.W. Trembath 44 (PERTH).

*Distribution and habitat.* Currently known from a small area near Darkan (Figure 3) in the Southern Jarrah Forest bioregion (Department of the Environment, Water, Heritage and the Arts 2008). Grows in *Eucalyptus marginata*-*Corymbia calophylla* woodland over lateritic soils.

*Phenology.* Flowers mostly between August and September. Mature fruit has been recorded for October and November.

*Etymology.* From the Latin *sub* (somewhat, not completely) and *sejunctus* (disunited, separated), a reference to the remarkable morphology of the mature fruit which is so deeply lobed that the individual locules are almost completely separated from each other.

*Conservation status.* Department of Parks and Wildlife Conservation Codes for Western Australian Flora: Priority Two (Smith 2013), as *L. sp.* Darkan (R.S. Smith BNC 1047). This species is known from six populations, including one in a nature reserve and another in a conservation park. Although usually locally common where it does occur, it appears to have a restricted distribution and is very likely to be a short-range endemic.

*Affinities.* In its vegetative and floral morphology *L. subsejunctus* closely resembles some variants of *L. pulchellus*. As currently accepted the latter is a very variable species and probably comprises segregate taxa. In particular it shows remarkable variation in fruit morphology, both in terms of the overall shape and transverse section of the drupe as well as the presence of an indumentum. However *L. subsejunctus* differs from all variants of *L. pulchellus* in having a drupe (Figure 1E) that is so deeply lobed as to closely resemble a schizocarp in, for example, the genera *Diplopeltis* Endl. (Sapindaceae) or *Heliotropium* L. (Boraginaceae). Even in flowering collections of the species these ovarian lobes can be discerned. This provides an aid to identification in the absence, at the flowering stage, of any other characters by which it can effectively be separated from *L. pulchellus s. lat.* Populations of the two species are known to occur within as little as 12 km of each other between Collie and Darkan.

*Notes.* A fruiting specimen has been chosen as type of this species because it is the fruit character that in large part distinguishes it from the otherwise very similar *L. pulchellus*.



Figure 7. *Leucopogon subsejunctus*. Photograph of flowering branchlet from M. Hislop 4061. Scale bar = 2 cm.

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## References

- Bentham, G. (1868). *Flora Australiensis*. Vol. 4. (Reeve & Co.: London.)
- Department of the Environment, Water, Heritage and the Arts (2008). *Interim Biogeographic Regionalisation for Australia (IBRA), Version 6.1*. <http://www.environment.gov.au/parks/nrs/science/bioregion-framework/ibra/index.html> [accessed 28 February 2013].
- Hislop, M. (2008). Three new species of *Leucopogon* (Ericaceae: Styphelioideae: Styphelieae) from the far south-west of Western Australia. *Nuytsia* 18: 61–78.
- Hislop, M. (2009a). The taxonomy of *Leucopogon bossiaea* and allied species (Ericaceae: Styphelioideae: Styphelieae) from the central south coast of Western Australia. *Nuytsia* 19: 17–35.
- Hislop, M. (2009b). New taxa in the *Leucopogon gracilis* group (Ericaceae: Styphelioideae: Styphelieae). *Nuytsia* 19: 211–228.
- Hislop, M. (2011). New, locally endemic taxa in *Leucopogon* (Ericaceae: Styphelioideae: Styphelieae) from the Perth and midwest regions of Western Australia. *Nuytsia* 21: 75–89.
- Hislop, M. (2012). Two new species from the *Leucopogon distans* group (Ericaceae: Styphelioideae: Styphelieae) and the reinstatement of *L. penicillatus*. *Nuytsia* 22: 1–16.
- Hislop, M. & Chapman, A.R. (2007). Three new and geographically restricted species of *Leucopogon* (Ericaceae: Styphelioideae: Styphelieae) from south-west Western Australia. *Nuytsia* 17: 165–184.
- Quinn, C.J., Crayn, D.M., Heslewood, M.M., Brown, E.A. & Gadek, P.A. (2003). A molecular estimate of the phylogeny of Styphelieae (Ericaceae). *Australian Systematic Botany* 16: 581–594.
- Smith, M.G. (2013). *Threatened and Priority Flora list for Western Australia*. (Department of Parks and Wildlife: Kensington, Western Australia.)
- Western Australian Herbarium (1998–). *FloraBase—the Western Australian Flora*. Department of Parks and Wildlife. <http://florabase.dpaw.wa.gov.au> [accessed 11 April 2014].